Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code: 170503 **Date:09/12/2015**

Subject Name: Plant design & Project Engineering

Time: 10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	The trend in the fertilizer industry during the past few years has been toward larger and larger fertilizer plants. In terms of plant location, what are the more important factors that should be considered and which factors become even more important as the size of the plant is increased? Are these factors of equal importance regardless of the type of fertilizers produced? Analyze this situation for ammonia and urea process plant.	**04+03**
	(b)	A distillation unit has been designed to handle a very hazardous material. The unit utilizes a reflux drum and buffer storage. List several ways in which the inventory of the hazardous material can be reduced or eliminated. Sketch and instrument the system that is recommended.	**07**
Q.2	**(a)**	Enlist various methods of estimating capital cost investment and explain any one in brief. What criteria do you look for the selection of a method?	**07**
	(b)	A proposed manufacturing plant requires an initial fixed capital investment of $ 900,000 and $ 100,000 of working capital. It is estimated that the annual income will be $ 800,000 and the annual expenses including depreciation will be $ 520,000 before income taxes. A minimum annual return of 15% before income tax is required before the investment would be worthwhile. Income taxes amount to 34 percent of all pre-tax profits. Determine the percent return on total investment before and after income tax.	**07**
		OR	
	(b)	A machine in a process generates a positive net annual cash flow of ₹ 45000. Two alternatives are available. Machine A costs ₹92500 and requires replacement in every 4 years. Machine B costs ₹1,35,000 and requires replacement after every 7 years. Neither machine has any scrap value. The cost of capital is 15%. Maintenance cost and other annual costs are same for both machines. Which machine should be selected?	**07**
Q.3	**(a)**	What is Pilot Plant? State the importance of pilot plant. Explain cost index with an example	**07**
	(b)	Discuss the method for evaluation of total product cost showing the individual components.	**07**
		OR	
Q.3	**(a)**	Define depreciation. State and briefly explain various methods of determining depreciation.	**07**

(b) The owner of a property is using unit-of-production method for determining depreciation costs. The original value of the property is $55,000. It is estimated that this property can produce 5500 units before its value is reduced to zero; i.e. the depreciation cost per unit produced is $10. The property produces 100 units during the first year, and then the production rate is doubled each year for the first 4 years. The production rate obtained in the fourth year is then held constant until the value of the property is paid off. What would have been the annual depreciation cost if the straight line method based on time had been used? **07**

Q.4 **(a)** Discuss the practical factors in alternative investment and replacement studies. **07**

(b) Define/explain the following terms in context with plant design and project engineering: **07**
(i) Current and cash ratio (ii) Critical path (iii) Salvage value (iv) Payout period (v) Breakeven point (vi) Battery limit (vii) Turnover ratio

OR

Q.4 **(a)** Define layout of a plant. Discuss the principles of the storage layout and equipment lay-out in a process plant. Write a brief note on 'Scale Model' **07**

(b) State the advantages of standard equipment over special equipment. What are the different types of flow diagrams? **07**

Q.5 **(a)** The following activities are part of a project to be scheduled using CPM. Draw the network diagram and find out the critical path. **07**

Activity	Immediate predecessor	Time (weeks)
A	--	1
B	A	4
C	A	3
D	A	7
E	B	6
F	C,D	2
G	E,F	7
H	D	9
I	G,H	4

(b) State and explain the factors affecting investment and production cost. **07**

OR

Q.5 **(a)** What are simple and compound interests? Can interest be considered as a profit? It is desired to borrow $ 1000 to meet a financial obligation. This money can be borrowed from a loan agency at a monthly interest rate of 2%. Determine the total amount of principal plus compounded interest due after 2 years if no intermediate payments are made. **03+04**

(b) Discuss the selection criteria of valves. Name commonly used pipe fittings and valves with their main functions **07**

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